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THERMOMETERS.

By Gustavus Pile.

The thermometer as an instrument for ascertaining the temperature of various bodies was not given a practical form till less than two hundred years ago, and the people who lived before that time never had the pleasure of knowing how hot or how cold they were, and no one ever spoke of a fall in mercury or a rise in spirits. It seems strange that an instrument like this should for so long a time have escaped the attention of philosophers and thoughtful minds, and even the Chinese, who claim to be the originators of nearly everything worth inventing, quite overlooked it, and it remained for an Italian doctor to first conceive of a method to indicate the temperature of the atmosphere. It was about the beginning of the seventeenth century when a Doctor Santorio, of Padua, from knowing that the addition of heat produced an expansion of air, constructed a very simple affair by which he was enabled to observe the extent of expansion that took place. This instrument consisted of a long tube with a bulb blown on one extremity and left open at the other end. The open end was placed in a vessel containing a colored liquid and the ball heated with a lamp. This caused the air in the ball to expand and partly escape through the open end. When the heat was withdrawn and the air in the ball began to cool, a contraction took place, and the colored liquid rose up in the tube till the expansive force of the air in the ball was the same as the atmospheric pressure on the liquid. There was no scale or marking of any kind attached to this, only the rise and fall of the column being noted.

As such an instrument as this could not conveniently be carried from place to place and having no scale for reference or comparison, it had little practical value; its chief purpose being to draw attention to the subject and open the way for further discoveries. Efforts were soon made to construct something that would be portable and more durable, and as a result, a few years later, an instrument was brought out made somewhat after the manner of the first one, but inverted. A glass ball was blown having an opening at the top through which a glass tube, open at both ends, was inserted and passed down to near the bottom of the ball and under the colored spirits that partly filled the ball. When heat was applied the air in the ball began to expand and the spirits was forced up in the tube. A scale for this followed shortly after, not engraved or marked on the tube, but a few lines were ruled on a piece of wood which was held against the tube when it was desired to read off the height of the column. The top mark on this scale was made to indicate the hottest day in summer and the lowest mark was placed where the column stood when the ball was placed in snow. When the space between the two points was divided into sixty parts, which followed later on, it completed the discovery of the thermometer.

It was only a short time after, somewhere about the middle of the seventeenth century, that thermometers were made having the spirits introduced into a bulb from which all the air was expelled and having the opposite end of the tube sealed over, very much the same as those still in use. The honor of constructing the first mercurial thermometer belongs to Römer, who about 1709 produced an instrument of this kind, only failing to add a scale to make it complete. It was in 1724 that a scale having fixed and definite points for graduation was invented and introduced by Fahrenheit. Taking boiling water to indicate one point and melting ice the other point, he divided the space into 180 equal parts, and this scale applied brought the thermometer to full completion. The object Fahrenheit had in view when he fixed the zero point 32° below freezing is quite unknown and has puzzled many inquiring minds, but when he selected the two points named for the foundation of his scale, he did a very wise thing, for experience has proved them to be the very best that could have been chosen and it will always remain to his credit.

Very fortunately for the thermometer maker, the situation of the

freezing point can be determined with great accuracy, for water containing ice will remain at the same temperature just as long as there remains any ice to be used up, any accession of heat being used in melting the ice. The boiling point of water, however, is not so reliable, but being somewhat changeable its determination is attended with greater difficulty. The density of the atmosphere or barometric pressure has considerable effect upon it; the purity of the water and the nature of the vessel used also produce more or less deviation, and have to be taken into account by the maker who desires to furnish reliable instruments. However, these difficulties can all be overcome, and with proper care and allowances these variations can be corrected. In making a thermometer it is of great importance to select a piece of tubing that has been evenly drawn throughout its entire length. If at any part the bore should be enlarged the column of mercury will become shortened and will register too low, likewise if the bore should be contracted the column will be lengthened and will register too high; hence the great necessity of being sure that the tube has an equal bore at every point. This important fact is determined by introducing a small amount of mercury, just enough to make a short length, say about 2 inches, and then moving it slowly from one end of the tube to the other and measuring it as it travels along. If it remains the same length throughout, the tube is fit for use and is sealed over at the ends for protection against dust and moisture.

Now it must not be supposed that the maker of thermometers goes to all this trouble and time with all the instruments he turns out. Nor is it necessary in all cases, but only when making a standard by which others are compared, as will be hereafter explained. Having selected the proper tubing, a bulb of the required size to hold the mercury is blown on one end. This operation requires considerable skill and practice on the part of the glass blower, for a bulb that is too large will make the scale too extended, and if too small will cause the degrees to be too close together. A bulb also is blown on the other end of the tube for the purpose of filling. By means of a small funnel a sufficient amount of mercury is introduced into the upper bulb. Heat is then applied to the lower bulb to drive out a portion of the air and this, when allowed to cool, becomes partially filled with the mercury. Heat is again applied to the bulb till the mercury boils and is driven out, carrying

with it all traces of air and moisture. On cooling, the mercury is drawn down into the bulb which it completely fills. After standing a while, should any air bubbles appear, the operation has to be repeated, for the presence of air, even in minute quantities, is sure to work mischief. When the thermometer is properly filled the upper bulb is cut off and the tube drawn out to a fine point. It is then placed in a liquid heated to the temperature that its extreme height is to represent, and after all excess of mercury has escaped it is sealed over in the flame, and this completes the thermometer. It has been observed that after being laid aside for a time the column of mercury shows some degree of contraction, which in the course of a year amounts to as much as a degree or two. Hence it is best to lay newly made thermometers aside to season before graduation in order to provide against such changes.

After the requisite time has elapsed, the graduation is accomplished by introducing the thermometer into a vessel of finely broken ice and allowing it to remain till the column of mercury no longer recedes, it is then pointed off by making a nick on the tube with a fine file. The boiling point is ascertained by placing the thermometer in a jacketed vessel which is filled and surrounded with steam supplied by boiling water in the bottom of the inner section. After sufficient time has elapsed to allow the whole to become fully heated, it is pointed off as before and laid aside to cool. The space between these two points is then divided into 180 parts and after being numbered the thermometer is ready for use. As the increase in the volume of mercury is quite uniform in proportion to the heat added, the divisions will be all equal when a perfect tube is used, and this is essential in making a standard instrument. For ordinary thermometers it is not customary to calibrate the tubes, but in order to obtain satisfactory results several intermediate points are taken with the aid of a standard and the required divisions made between them. Generally the points selected are 32°, 92°, 152° and 212°, making 60 divisions between each section, and for more accurate work every 30° are registered. The great discrepancy found in the thermometers made up for the trade is from the fact that the intermediate points are not observed. A top and a bottom degree only are pointed off and the rest of the scale has to take chances for correctness. So when it is considered how difficult it is to procure even a small amount of tubing that has an equal

calibre at every part—and by far the greater portion is very far off in this particular—it is no wonder that it is only by accident that one happens to become the happy possessor of a first-class instrument. Where it is imperative to determine the temperature with exactness, the only recourse is to have the thermometer verified and use the necessary corrections in connection with it.

My advice is to try the freezing and boiling points of every thermometer to be used, for one can rest assured that if these do not register correctly there is very little probability of any other part being of much value. One other fact should not be overlooked in selecting a thermometer, namely, the complete absence of air. This can readily be determined by inverting the instrument and giving a few taps on the end, when, if free from air, the mercury will completely fill the tube and show an empty space in the bulb, this again will disappear when the instrument is turned to its proper position and the mercury descends in the tube to its normal place. Besides these precautions there is nothing to indicate a good thermometer except a comparison with one of known accuracy.

COCOA: ITS PRODUCTION AND USE.

By William B. Marshall.

One of the engravings in Dufour's "Treatise on Coffee, Tea and Cocoa," published in 1688, shows a Chinaman, a Turk and an American aborigine having a merry good time at a liquid banquet—the Chinaman with his tea-pot and tea, the Turk with his coffee-pot and coffee, and the American with his chocolate urn and cocoa. Another picture in the same work shows a Turk, an American and a Chinaman, each with a cup of his favorite beverage. Contentment glows on the face of each, but the way in which the Turk and Indian regard the Chinaman indicates that they are thinking or saying, "Your tea may be good, but what I have here is far better," and of the three the Indian seems best pleased. Theoretically, cocoa should hold first rank in the field of table beverages, but in practice the order of rank is coffee first, tea second and cocoa third. They hold this relative rank in the quantity grown and used, in the commercial value and in the frequency of use. All this is so notwithstanding the fact that nearly everybody likes cocoa from the very first time it is tasted, and

that it is almost entirely free from the attacks to which coffee and tea are subjected by those who consider their use unhealthful.

To compare the use of cocoa to the use of coffee and tea would be somewhat like comparing cake to bread. The cake is used in less quantity, is more expensive, is more nourishing, and appeals more sharply but less enduringly to the taste than the bread. So with cocoa. Its appearance on the table at intervals, even frequently, is hailed with delight, but it has not been able to establish itself to any great extent as part of the regular diet. Tea and coffee, though of less pleasing taste, are wanted almost as regularly as bread and the cocoa is wanted occasionally like the cake. As cocoa is usually prepared with milk, the beverage is much more expensive than tea and coffee, which are prepared with water. The raw cocoa itself also is more expensive than either of the other two materials, if account be taken of the amount and cost of each required to make an equal quantity of beverage. The milk, the cocoa and the large quantity of sugar used to sweeten to taste, all combine to make the beverage a rich and concentrated food, and, after a period of its steady use, headaches and other slight derangements, cause one to turn from it, just as happens after a surfeit of sweets. Doubtless a part of this result is due to the fact that the milk is boiled and is taken while hot, and hence has effects different from those attaching to the use of cool, raw milk. What has been said above is not to be considered as being at all derogatory to the value of the beverage as a food, but rather as being a hint that in diet there must be a balancing of quality and quantity. An increase in the former should be accompanied by a decrease in the latter. Unfortunately, because of habit, we are momentarily uncomfortable, unless we receive a certain cubic measurement of food at the usual periods, and we are inclined to fill up to a certain point without much present concern as to whether the filling is a highly concentrated food or a preparation of sawdust, so long as the palate is pleased, the cubic requirements satisfied and the usual length of time spent in eating.

From personal experience, I am able to praise the food value of cocoa, whether it be in beverage form or in the form of chocolate. In the latter form, it is especially valuable on occasions when a meal is to be postponed for an hour or two, as often happens when one is traveling. Possibly it is an unconscious recognition of its food value that makes chocolate one of the most popular of the confections and

other materials offered for sale by newsboys on trains. While considering this portion of the subject, one might find amusement and profit by inquiring into the facts which underlie the very common offering of chewing-gum and chocolate side by side in the slot machines—the former being usually in the 5 cent side of the machine and the latter in the 1 cent side. And why can both these sell through inanimate machines, while the cough drop, which formerly had the streets to itself, seems to require not only a man, but a man in continual motion, to effect a profitable number of sales.

The cocoa trees belong to the large plant order *Sterculiaceæ*, which contains nearly fifty genera and more than five hundred species. The order is remarkable because of the immense size of some of its trees. The *Adansonia digitata*, or baobab tree, of Africa, which yields the fruit called monkey bread, often has a trunk more than 20 feet in diameter. The ceiba trees are remarkable not only for their size, but also for the immense buttresses which bolster up the trunk on several sides, and whose bases extend many feet from the center of the tree. The order includes not only large trees, but also shrubs and tender herbs, and, as might be expected from the large number of its species, it yields many economic products, such as timbers, medicines, gums, fibers, foods, etc. The most important, and among the most interesting of the Sterculiaceous plants, are the cocoa trees—the source of cocoa, chocolate and cocoa butter. The flowers and fruits of many of the order have a foul odor, and hence the ordinal name *Sterculiaceæ*, from the Latin *Sterculius*, the patron deity of manuring, from *stercus*, meaning dung. Notwithstanding the uncomplimentary name that has been given to the order the deliciousness of the beverage cocoa has gained for the genus which includes the cocoa trees, the name *Theobroma*, meaning a food for the gods. There are several species of cocoa trees in cultivation, but the most important of them is the *Theobroma cacao*, L., which is cultivated almost to the exclusion of the others. Many agricultural varieties have been produced through selection and cultivation.

The tree attains a height of from 15 to 35 feet, and a diameter of from 12 to 15 inches. The trees are arranged in rows, either by planting seeds or by setting out nursery plants. At a little distance the plantation resembles in a general way an apple orchard, the cocoa trees having an irregular growth like the apple, and the trunk often being distorted and leaning like that of the apple, but of smaller

diameter. The leaves are evergreen, glossy, thick and large. They commonly reach a length of 8 to 15 inches, and often are much longer. The flowers are very small, and have five yellow petals in a pink calyx, on a stalk about an inch long. As with many other plants, there is no relation between the size of the flower and the size of the fruit. The cocoa flower is so small as to be insignificant, but the fruit which it produces is 5 to 10 inches long, 4 to 6 inches in diameter, and weighs several pounds. The morning glory's flower is many times as large as the cocoa flower, but its fruit is many thousand times less, both in size and weight, than the cocoa fruit. More striking instances of the absence of anything like a uniform ratio between size of flower and size of fruit could readily be cited.

The cocoa flowers appear in clusters in the axils of present or former leaves on the larger parts of the tree, including the trunk almost to the ground. Consequently the fruits appear at the same places, viz.: on the trunk and thicker branches. In this respect the cocoa tree is one of the exceptions, as most trees bear their fruits on the smaller branches. As the cocoa fruit weighs several pounds, it is reasonable to suppose that the smaller branches would be unable to support the weight, and hence the burden is relegated to the trunk and stouter branches. In our own region, we do not commonly see fruits borne in this way, but instances are not altogether wanting. The fruit of the Osage orange is often borne on the thicker limbs, and even on the trunk. In this case, as in the case of cocoa, the weight of the fruit has probably been the chief factor in determining the points at which it shall be borne. When ripe, the cocoa fruit is of a golden-yellow or yellowish-brown color. It comes to maturity in about four months after blossoming. In shape it very much resembles our spindle-shaped muskmelon, except that it is a little more pointed at the end. Running from the stem end to the bud end of the fruit are several depressions, which divide the surface of the pod into segments, such as we see in the muskmelon. The skin is quite smooth. The fruit is often compared to the cucumber to give an idea of its shape and general appearance, but the resemblance to the muskmelon is much closer. When fresh, the rind is tough and leathery, easily indented with the finger nail or cut with a knife. In this condition the fruit is solid and heavy, being filled with pulp and seeds. The seeds at this time are soft—somewhat firmer than a ripe lima bean. When the fruit is dried, the pulp disappears, the

beans become hard and brittle, and the rind becomes hard and woody. The interior being now empty of all the pulp, except a few stringy remains, the seeds rattle about with every disturbance of the shell.

Each fruit contains from twenty to forty seeds, which, when cured, become the cocoa beans of commerce. Each seed is enclosed in a pale crimson, paper-like husk which is somewhat hairy on the outside but very smooth and shining on the inner surface. It adheres closely to the kernel, but the latter shrinks away in drying, and still more in the roasting process, so that the shell may be easily cracked and removed. The kernel consists of two very large cotyledons, remarkable for the way in which they are twisted and folded and for the manner in which the radicle or germ spreads out to all parts of the seed to line every twist and fold. The germ is hard and stony. It is, of course, physiologically of prime importance since it is the part which sprouts when the seed is planted. To the manufacturer also it is important because of its uselessness to him, and its removal adds one step to the work of making cocoa.

The trees begin bearing about the end of the third year and are in their prime at the tenth year. They continue to yield profitable crops for thirty-five to forty years. It is estimated that the average yield is about thirty-six fruits or 3 pounds of commercial cocoa beans per tree per annum. Sometimes a tree will bear eighty to a hundred fruits in the year, yielding 7 or 8 pounds of beans. In exceptional cases the yield may be even greater than this. Flowers and fruits in all stages of development may be found at all seasons of the year, but there are two principal harvests—one in June and one about Christmas, the former being called in American countries the harvest of San Juan and the latter the harvest of La Natividad.

In harvesting, those fruits which grow within easy reach are cut off with a machete, while those which hang high are brought down by means of a long pole with a knife so arranged at the top that it will cut either by a thrust or a draw. The ripe fruits are known by their golden-yellow or brown color or by sounding hollow when rapped. In cutting, care is necessary to avoid injuring the swelling or "eye" on the tree at the point where the fruit stem is attached, as it is this swelling which produces the future fruit.

The fruits are generally allowed to pile up for a day or two and are then cut open and the pulp embedding the seeds is readily taken

out by a deft movement of the hand or of a wooden spoon which is often used for the purpose. During this operation a large portion of the pulp is removed by the mere handling, and as the pulp is soft and juicy another large portion drains off as liquid. The beans are then packed in barrels or boxes, covered over with banana leaves, snugly stacked and allowed to ferment for three or four days. As in all operations making use of fermentation great watchfulness is necessary to prevent a too rapid or too great rise in temperature. Very often, and especially in parts of Venezuela, the fermenting is done by placing the beans in holes in the ground and covering them with clay. Beans prepared thus are known as clayed cocoa. The clay used is of a warm brick-red color and greatly improves the appearance of the cured bean, without, however, having any great effect upon the judgment which an expert dealer in cocoa will pass upon the quality of the inside of the bean. In the fermenting process the color changes from a pale crimson to the dark brown which the seeds have when they reach our markets; the kernel loses nearly all its bitterness, and even in this unroasted condition, if sugar be added, it tastes much like chocolate.

The next operation is to remove nearly all the remaining pulp and the slime of fermentation. This is done by slipping and squeezing the beans through the hands or by dancing among them with the bare feet. They are then to be thoroughly dried—usually by exposing them to the sun, but often by passing them over steam coils. On a small scale the sun drying is done by exposing the beans on mats or trays or anything that will permit easy and quick handling. On large plantations the drying is done on box-like platforms especially constructed for the purpose. These platforms are raised a little from the ground and have a sliding peaked roof which may be quickly slid back and forth so as to cover or uncover the drying beans. The object of the sliding roof is to protect the beans from rain or sudden dampness, either of which, if allowed to reach the beans after the drying has begun, would greatly lower the quality. The roof is used also to protect the beans from the burning heat of the sun during the middle of the day. After a final sorting, which is done by hand, the beans are bagged and are ready for market.

The cocoa tree originated in northern South America, but it has been introduced to all parts of the world in a broad zone on both sides of the equator. It can be cultivated as far as latitude 25°

north and south, but its cultivation as an industry may be said to be confined to the belt between latitude 15° north and 15° south. In suitable stations (sea level to 1500 or 2000 feet) it is cultivated from middle Mexico to central South America, many of the West Indian Islands, the East and West coasts of Africa, India, Ceylon, Java, Borneo, northern Australia and many of the Polynesian Islands. Usually the bean takes its commercial name from the country producing it, but the products of some countries are known by names otherwise derived. The Mexican is known as Mexican, or Soconusco; the Brazilian as Brazilian, Bahia or Maranham; the Venezuelan as Maracaibo or Caracas; the Ecuadorean and Peruvian as Esmeralda or Guayaquil; that of Guiana as Berbicé. Ecuador grows and exports a larger quantity than any other country, and cocoa is perhaps her most important product. Trinidad comes next. Venezuela comes third. The African crop is growing in importance, and its export exceeds that of Venezuela, and is approaching that of Trinidad.

Cocoa was the first of the three great beverages to make the conquest of Europe, but, when coffee came into the field, cocoa had to take second place, and then came tea to wedge itself between the other two, thus pushing cocoa into third place.

Payen gives the following percentage analysis of cocoa: Fat (cocoa butter), 52; nitrogenous compounds, 20; starch, 10; cellulose, 2; theobromine, 2; saline substances, 4; water, 10; cocoa red and essential oil, trace. Until a few years ago theobromine, caffeine and theine were thought to be chemically different, but they are now believed to be identical, not only in composition, but also in their effects. All three are mild cardiac stimulants, and it is chiefly this effect that has been the handle of the sword in the onslaughts that have been made against the use of tea and coffee. During their whole history, and especially during their early history in Europe, they might have said, as Robert Burns said when one of his moral shortcomings attracted particular attention, "the more they clatter the better I'm kenned." Cocoa has never been subjected to any of the opposition that has beset the paths of the other two beverages, although it contains about 2 per cent. of theobromine, while tea contains 2 to 3 per cent. of theine, and coffee contains from 1 to 2 per cent. Hence, in the matter of the alkaloid, cocoa deserves a trifle better standing than tea, and a little poorer stand-

ing than coffee—when the percentages of theine and theobromine in the raw materials are considered. But how much theine goes into a cup of tea, how much caffeine into a cup of coffee, and how much theobromine into a cup of cocoa or a cake of chocolate? And, further, what part of each after reaching the stomach can place itself on such intimate terms with its host as to call forth heartfelt responses? In determining what amount of each alkaloid finally reaches the stomach, account must be taken of the fact that for each cup of the respective beverages tea leaves are used in almost featherweight quantities, coffee is used by the tablespoonful and cocoa is used by the teaspoonful. Of the tea and coffee the leaves and grounds are left in the pot, and they retain at least a part of the theine, while the cocoa, being an emulsion, is all consumed and all the theobromine is swallowed. Tea and coffee are generally denied to children and invalids, but this is rarely or never the case with cocoa; and children are allowed to eat large quantities of chocolate candy without receiving any warning other than that which is so often necessary to keep them from stuffing. On account of their tender years and as their systems are unaccustomed to the alkaloid it might be expected that in the sudden use of cocoa and chocolate the theobromine would manifest very obvious effects, just as tobacco, the first time it is smoked, has effects which are unequalled at any future smoking; but such does not appear to be the case, and about the only marked effects are such as come from an improper adjustment between quantity and quality of food. Except in the matter of alkaloid, cocoa differs in all respects from tea and coffee, as it is a true food, and the other two are not, their main value consisting in the tendency of the theine to retard waste of tissue. The cocoa has the double effect of retarding waste because of the theobromine; and of furnishing the material for new tissue and for energy, because of the starch, oil and nitrogenous compounds.

Upon entering a cocoa and chocolate factory, the sight of a number of various kinds of machines leads one to suppose that the manufacture involves very complicated processes; but, as a matter of fact, the reverse of this is true. The earliest tools used for the purpose were simply a stone and pestle, or roller for crushing the roasted seeds to powder. Practically every step in the making of chocolate is simplicity itself, and the making of a loaf of bread involves as much, if not more, science. The essential steps are the

following: roasting; crushing and winnowing to remove the outer shell and the husky matter which lines each twist and fold of the kernel; removing the hard germ or radicle; grinding to a paste; cooling. This gives cocoa. If it is to be made into sweet chocolate, the paste is flavored and sweetened. All the operations can be performed by hand; but machinery has been developed to such an extent that the handwork is nearly restricted to stoking the fires and shifting the cocoa from time to time into positions where the machinery may set to work on it.

When the beans are broken out of the bags, they are sifted, cleaned and sorted in order to remove foreign matter and unsound beans. They are then roasted in revolving cylinders, in which operation the flavor is greatly improved, and the shell and kernel become brittle, so that they are easily separated from each other, and the kernel is easily broken into small grains. The beans are then fed into a crusher, which breaks them into small pieces. As they fall from the crusher, a blast of air winnows out the hull and the tough linings of the folds. The small grains of pure cocoa and the hard germs fall together in one pile. The grains are known as cocoa nibs, or cracked cocoa. Some people prefer to buy the nibs rather than the further prepared cocoa, because they feel assured that in this form there is no adulteration. When the nibs are used, they require further crushing and long boiling to prepare them for the table. In this form the cocoa contains all its oil, and makes an exceedingly rich beverage. After the germs are removed by a machine especially adapted to that purpose, the nibs are fed to heated mill-stones, or to grinding machines which work on much the same principle. In the grinding they are reduced to a thick paste, and not, as one would expect, to a powder. This is due to the great amount of oil which they contain and which the heat and friction soon turns into a fluid. During the grinding, a large part of the oil oozes from the machine, and is caught in drip-pans. It is a thick and creamy liquid; but upon cooling, it hardens into a waxy solid of the color of manila paper. This is the crude cocoa butter of commerce. The cocoa paste then has some of the oil returned to it or some taken away, according to the degree of richness which the manufacturer wishes his product to have. The paste is then placed in pans, and the resulting cakes are the cocoa, or "plain chocolate," from which the beverage is made. When the cocoa is to be almost entirely free

from oil, the paste is subjected to pressure, and the hard mass resulting therefrom is known as rock cocoa.

Much of the caked cocoa is ground to powder and packed in tins, so that when it reaches the consumer it is in about the same condition as when it left the factory, and no grating is necessary to prepare it for infusing. The paste mentioned above, if it is to be made into the confection chocolate, is usually enriched by returning some or all of the oil, and is flavored with cinnamon or vanilla, sweetened, molded into cakes, cooled and wrapped in fancy papers. The gloss on the edges and one flat side of the cake is due to the contact of the chocolate with the molding pan, just as a cake of cornmush is glossy wherever it has been in contact with the pan. After it is molded, the chocolate must be kept cool in order to retain its firmness and the gloss. On this account, the up-to-date chocolate factory is supplied with a refrigerating plant in order that the storage-rooms may be kept as cool as desired. The depth of color gives some hint as to the amount of oil the chocolate contains. The richest grades are those used to coat the very finest chocolate creams, and they are often so dark as to deserve to be called black rather than brown. A chocolate which, when held in the hand, quickly softens, smudging the fingers, contains much oil.

The cocoa shells or hulls are not thrown away nor burned, but are sold to be used for making a beverage similar to cocoa, but far inferior. In Ireland this stuff is called "miserables."

The cocoa butter, the Oleum theobromatis of the Pharmacopœia, is a fixed oil which at ordinary temperature is solid, but which melts at from 86° to 92° F. When bleached and refined it loses its pale-yellow color and becomes snow white and glistening like cold lard. It is a trifle lighter than water, its specific gravity being ·97 to ·98 (at 59° F.). Unlike a great many oils it does not become rancid from long standing. Repeated meltings and hardenings affect its quality but little. On these accounts it is especially valuable for many purposes. It is very nutritious and its odor and taste are pleasant, making it a valuable substitute for cod-liver oil in cases which require that kind of a tonic and yet in which the palate and weakened stomach rebel against nauseating doses. The butter is used to a very great extent as the chief material in suppositories and in various cosmetics and pomatums. For these purposes it is admirably adapted because of its soothing and healing qualities, its

freedom from acid and from the fact that although it is usually firm the temperature of the body quickly reduces it to a fluid condition. The low temperature at which it melts has made it one of the chief materials depended on for medication when the need is for a salve or ointment that shall rapidly turn to a fluid and be absorbed. The plain cocoa butter, without medication of any kind, is an excellent ointment for chapped hands and lips. The butter is also used for making fine soaps and in some of the cream confections.

The correct name is cacao and not "cocoa," and according to rules we should say cacao. But our people claim the right to break the rules to suit their convenience, and, with the exception of a few purists, they have used the word cocoa. In fact, cacao is altogether unknown to the greater number of our people. To pronounce it in their presence calls forth a question which makes it necessary to explain by the word "chocolate" or "cocoa." When the grocer is asked for cocoa he should, according to the dictionary, hand out a preparation of cocoanut, but in every case he will hand out the beverage material forming the subject of this paper. The people of this country have long since discontinued the use of "cocoa" to indicate any of the food products of the cocoa palm and always add the word "nut," making the word cocoanut. Cocoa fiber used in cocoa matting is derived from the cocoa palm or cocoanut palm and has no relation whatever to the beverage cocoa.

Great numbers of our people believe that cocoa (cacao), coca and cocoanut are the same product or that they are derived from the same source. There is, of course, no close relation among them, as they come from three different plant orders and are used for different purposes. There is also some confusion between "cocoa" and "chocolate," some persons using "chocolate" to indicate the confection, the cocoa in cakes and the beverage, while others use it to indicate the confection only, calling all the unsweetened forms and the beverage cocoa. The tendency is to use "chocolate" to indicate all the manufactured forms of cocoa and the beverage also. One of the largest cocoa and chocolate manufacturing firms has published the following definitions:

Cocoa.—The commercial name given (1) to the seeds of the small tropical tree known to botanists as Theobroma cacao; (2) to the cracked or coarsely ground product of the roasted seeds, sometimes designated more particularly as "cocoa nibs" or "cracked cocoa;"

(3) to the finely pulverized product of the roasted seeds from which a portion of the fat has been removed, sometimes designated as "breakfast cocoa" or "powdered cocoa."

Chocolate.—(1) The solid or plastic mass produced by grinding to fineness the kernel of the roasted seeds of Theobroma cacao without removing any of the fat, sometimes called "plain chocolate" or "bitter chocolate;" (2) the same product to which have been added sugar and various flavoring substances, sometimes called "sweet chocolate" or "vanilla chocolate."

It is interesting to note our tendency to interchange "o" and "a" in certain words. "Cacao" wants to become or has become "cocoa;" "café" has become "coffee;" and "Curaçao" has become "Curaçoa."

LIME WATER.

By M. I. Wilbert.
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Despite the fact that lime water is probably the best known and most widely used of all pharmaceutical preparations, its peculiarities and shortcomings have received but little attention by investigators and pharmacists.

The fact that it may, and sometimes does, fall far short of what is usually understood by the term, lime water, has repeatedly been noted, while the reason for this shortcoming is no doubt to be found in the fact that, in by far the greater number of pharmacies, the care for and the making of this preparation is usually entrusted to the apprentice, or boy about the place.

That lime water is deserving of greater attention will become evident when we realize the very important part that it has, from time to time, taken in the armamentarium of the physician and also recognize the great harm that may possibly result from the use of a comparatively inert preparation.

Lime water has been used from the earliest times, and is to-day recognized as one of the most valuable remedies in a number of affections of the gastro-intestinal tract, particularly in the treatment of infants and children. Lime water is well known as an efficient antacid, and is also used quite extensively as a local application or as a necessary ingredient in preparations designed for external use, notably the well known lime liniment or carron oil. It is also used

as an addition to bring about chemical change of the more active substances, as in the well known black or yellow washes. All of these preparations, it will be noted, depend largely on the fact that the lime water used be of the full strength.

Lime water is official in all known national pharmacopœias, and although the official titles as well as the prescribed modes of preparing the solution differ materially, the ultimate object that is sought by all is practically the same—a saturated solution of calcium hydrate in water, at ordinary temperatures.

Calcium hydrate, as is well known, varies considerably in its solubility, being much more soluble in cold than in hot water, and differing in this respect from the majority of chemical substances. So little is known about the physical or chemical changes that are produced by the solution of chemical substances, in water, that it would be futile to attempt, at this time, a general discussion of the underlying principles or factors that regulate the solution of calcium hydrate. The subject has been investigated in a practical way by several persons, among them M. A. Lamey (*Comptes Rendus*, February, 1878, page 333), L. C. W. Cocx (*Arch. f. Phar.*, 1879, page 145), and Thos. Maben (*Phar. Jour.*, 1883, reprinted in A. J. P., 1884, page 110).

The United States Pharmacopœia of 1890 defines liquor calcis as "a saturated aqueous solution of calcium hydrate," and gives among other tests one for the quantitative estimation of the contained alkali. The Pharmacopœia does not, however, limit the allowable variation of the calcium hydrate in solution, but simply states that 50 c.c. of the official solution should require for complete neutralization about 20 c.c. of oxalic acid, decinormal volumetric solution, corresponding to about 0·148 per cent. of calcium hydrate.

The German Pharmacopœia, on the other hand, directs that lime water should contain from 0·148 to 0·167 per cent. of calcium hydrate, while the other requirements are practically the same as those of the U.S.P.

Just a word here as to the applicability of these two quantitative methods, from a practical point of view.

The German Pharmacopœia directs the use of a normal volumetric hydrochloric acid solution. This, in addition to the added difficulty of making the solution, has the objection of being unduly concentrated; 100 c.c. of lime water requiring only 4·0 to 4·5 c.c. of normal hydrochloric acid for complete neutralization.

The U.S.P. method, using a decinormal volumetric oxalic acid solution, has the advantage that a sufficiently accurate solution is readily made, by any pharmacist, while the solutions themselves are more evenly proportioned.

The testing of lime water can readily be done without the use of a burette, or other complicated apparatus, a 50 c.c. metric graduate being quite sufficient to measure the solutions. The test itself using phenolphtalein as an indicator is sufficiently interesting to appeal to any boy or apprentice, and if properly instructed, the latter would probably take considerable pride in standardizing his lime water.

To get some additional data as to the care devoted to the making of this preparation by the local pharmacists, a number of samples of lime water were purchased and examined. It will not be necessary to enumerate in detail the results of our investigation, suffice it to say that the samples as purchased varied from 0·043 to 0·165 per cent. of calcium hydrate, while by far the greater number of the samples fell below 0·148 per cent., the average requirement of the U.S.P. It may, however, be of interest to note that one-half of the samples contained less than 0·120 per cent., and one-fourth of the total, less than 0·085 per cent. of calcium hydrate, while, as noted before, one sample contained as little as 0 043 per cent. of the alkali. All of the purchased samples contained appreciable quantities of soluble sulphates, indicating that all had been made with common tap or city water. One sample contained appreciable quantities of a chloride, and this, on inquiry, it was learned, had been made from oyster-shell lime without separating the coarser particles, as directed by the Pharmacopœia. Further inquiry in this direction revealed the fact that the available oyster-shell lime, "Put up expressly for pharmacists," has not been sufficiently calcined and contains appreciable quantities of carbonates, which in turn appear to have, enclosed, soluble chlorides that are not readily washed out in the ordinary way. The difficulty can, of course, be overcome by following the U.S.P. directions and decanting the finer particles of calcium hydrate from the coarse lumps that usually consist of uncalcined carbonate.

Some experiments made with so-called C. P. calcium oxide, and also with calcium oxide from marble, did not give any appreciably better results than those made from ordinary lime. In ordinary practice, therefore, it would be perfectly safe to use commercial lime, providing several very essential precautions are observed.

The first of these is to use a lime that has been thoroughly calcined, and then to wash the resulting hydrate with distilled water, or at least, boiled and cooled water, until all traces of soluble salts have been eliminated.

The use of distilled or boiled water is to be recommended, as it facilitates the production of a more uniform, as well as a more stable preparation. This is to a large extent due to the fact that the contained gases, particularly the carbon dioxide, have been eliminated. In this same connection it may be well to call attention to the fact, noted by several of the investigators quoted above, that slaked lime that contains more than from 25 to 30 per cent. of carbonate is not suited for making lime water, as this contained carbonate appears to interfere with or to impede the solution of the hydrate.

A slight change in the Pharmacopœial directions for making lime water would also appear desirable. If instead of directing approximately 1 part of lime to 300 of water, the Pharmacopœia directed 1 part of lime to 25 or 30 parts of the solvent and allow the water to be replaced from time to time, or as long as the magma contains a sufficient quantity of hydrate to readily yield a satisfactory product, the directions would correspond more closely with the practice as usually followed.

The German Pharmacopœia directs that lime water should be filtered and dispensed perfectly clear and free from any suspended carbonate. This provision might well be included in our own Pharmacopœia, providing that the first portions of the filtrate be directed to be thrown away. This would be indicated by the fact that filter paper has a peculiar affinity for calcium hydrate, so much so that the first portions of lime water passing through a filter, lose from 15 to 20 per cent. of the contained alkali.

One other precaution that might well be observed in the making of lime water is to use cold water, and to keep the lime water containers in a cool place where they will not be subjected to sudden or extreme changes of temperature.

The more desirable Pharmacopœial changes might be summed up as follows:

Increase the relative amount of lime and permit the use of successive quantities of water.

Direct that lime water be dispensed clear, and that when filtered the first portion of the filtrate be thrown away.

Direct that freshly calcined lime, or lime that has been carefully preserved from the action of the atmosphere be used, and that it be comparatively free from carbonate.

Indicate a minimum as well as a maximum content of calcium hydrate and call attention to the desirability of testing lime water, from time to time, with a view of keeping it within the prescribed standards.

SOME RARE FIXED OILS.

By Dr. George R. Pancoast and Willard Graham.

There are a number of fixed oils for which there is a certain though limited demand in commercial circles and which for various reasons are difficult to classify. The best form of classification is probably the one based on the method of preparation.

Thus these oils can be grouped under the following divisions:

(1) Oils made by expression.

(2) Oils made by extraction with volatile solvents.

(3) Oils made by infusion with fatty solvents.

(4) Oils obtained as by-products in pharmaceutical manufacturing.

The oils made by expression are: Oils of walnuts, hazelnuts, hickory nuts, pumpkin seed, larkspur seed, stramonium seed.

The oils made by extraction with volatile solvents such as alcohol, ether, benzin and acetone are: Oils of lobelia, stillingia, larkspur, mullein, also in many cases, the oils given by expression.

The oils that occur as by-products in the manufacture of pharmaceuticals are: Oils of nux vomica, tonka, ergot, larkspur, strophanthus.

The oils made by infusion with fatty solvents are: Oils of lobelia, belladonna, stramonium, hyoscyamus, cantharides, capsicum; also many of the oils as given under expression and extraction.

The method used in making the oils by infusion in most cases closely resembles the formula as given by Dieterich for the making of oil of henbane.

"One hundred grammes of the coarsely powdered drug is moistened with 75 c.c. of alcohol and 2 c.c. of ammonia water and gently packed into a percolator of suitable size; let stand over night, then add 600 c.c. of olive oil and digest for 12 hours. The oil is then

removed by expression and the drug again treated with 400 c.c. of oil and this again removed by expression. Make up the product to 1,000 c.c. with olive oil."

We have had occasion to examine many of the above oils of which we give the following data:

	Specific Gravity 15° C.	Acid Number.	Saponification Number.
Oil of walnuts	0·925	3·5	197·0
" hazelnuts	0·917	3·5	192·5
" hickory nuts	0.921	2·3	195·6
" lobelia	0·925		
" strophanthus	0·927		
" pumpkin	0·920	3·5	195.5
" larkspur	0·884		
" nux vomica	0·935		
" ergot	0·918		

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EXAMINATION OF COMMERCIAL PEPPERS.

BY JAMES W. GLADHILL, A.M., P.D.

Although indigenous to Southern India, the pepper plant is now cultivated in different parts of the world, most of the commercial article coming from the islands of the Indian Archipelago, the Philippines and the West Indies.

It is recorded that in ancient times pepper was used as a medium of exchange. It was also used as a symbol of the spice trade, and in Rome the dealers in spices were known as Piperorii, later, in France as Pebriers, and in England as Pepperers.

The following is a description of pepper, based upon the official description, although the different kinds of pepper vary somewhat, as will be shown later. Black pepper, or the piper of the Pharmacopœia, consists of the unripe fruit of *Piper nigrum* Linné (Fam. *Piperaceæ*). The fruit is globular, about 4 mm. in diameter, reticulately wrinkled on the surface from the dried and contracted sarcocarp, blackish-brown or grayish black externally, lighter internally, and encloses a single globular seed, which is whitish, mealy and contains an undeveloped embryo in a central cavity.

White pepper differs from black pepper in that it consists of the ripe fruit of *Piper nigrum*, from which the pericarp and mesocarp

have been removed by immersion in water and subsequent rubbing with the hands; it is also made commercially by rubbing the hull off of the dried black pepper by friction in a machine designed for the purpose, in which case it is smaller than when made from the ripe fruit.

White pepper made from the ripe fruit consists of the seed, which is covered with a whitish coat, having 10 to 14 lines running from base to apex; under this is a reddish-brown testa, very thin, next the hard inside layer, and lastly around the central cavity is a mealy portion relatively thick. This is a general description of the two peppers. The different varieties which have been examined will be taken up separately.

The writer has examined 13 different kinds of peppers, all type samples, 9 of which were black peppers and 4 white peppers; they were as follows: Black peppers—Lampong, 4 samples; Lienburg, 4 samples; Singapore, 4 samples; Tellicherry, 4 samples; Trang, 2 samples; Aleppy, 2 samples; Acheen A, 4 samples; Acheen D, 2 samples; West Coast Sumatra, 2 samples.

White peppers—Coriander, 4 samples; Singapore, 3 samples; Penang, 3 samples; Decorticated, 3 samples. The hull was also examined in the same manner as the pepper.

The following determinations were made: Ash, ether extract, piperin and oleo-resin as being of the highest importance.

The following methods were used as being the simplest that could be devised. These can be used by almost any pharmacist without much expense.

Ash.—For the determination of the ash, 1 gm. of the ground pepper was heated to redness in a tared porcelain crucible, and maintained at that temperature for one hour, weighed, and reheated until the weight remained constant.

Ether Extract.—This was determined as follows: 10 gm. of the ground pepper were packed in a small cylindrical percolator, which was connected with an Erlenmeyer flask by means of a perforated and well-fitted cork. Into this cork a glass tube was also inserted and connected by means of a rubber tubing with another glass tube of equal caliber, inserted in a cork fitted to the top of the percolator. This constituted the ether-extractor, and from 40 to 50 c.c. of ether were used for making an extraction. The percolate obtained was transferred to a weighed beaker, the flask being washed

with a little ether, and was then set aside in a warm place, protected from dust, until the ether was evaporated; then a current of air was conducted over the beaker, until all ethereal odor had been removed, after which the weight was taken.

Piperin.—This constituent was determined as follows: 10 gm. of the ground pepper were exhausted with 95 per cent. alcohol, the percolate evaporated, then solution of potassa, $\frac{1}{10}$, about 100 c.c., was poured into the beaker and agitated, then set aside for twenty-four hours, shaking occasionally so as to facilitate the action of the alkali in dissolving the resin; then the portion remaining undissolved was collected on a filter, washed free from alkali and dried, then dissolved in 95 per cent. alcohol, the alcoholic solution filtered into a weighed capsule, the alcohol evaporated and the crystals weighed, as piperin.

Oleo resin was determined by subtracting the piperin found from the ether extract.

The peppers examined will be described in the order of their superiority. It is a custom in the trade to value them according to their weight per gallon.

There appear in the different peppers, grains which are not wrinkled to any great extent, and in which the outer coatings do not adhere to the inner layer; these will be spoken of as unwrinkled berries.

The term hull, as herein used, refers to the sarcocarp, which has been knocked off in handling. The quantity present indicates usually the way it is attached to the perisperm, whether it adheres strongly or not.

Singapore pepper comes from the island of that name. It is dark-brown, a few of the grains being black, with the edges of the wrinkles of a lighter brown or grayish color. Over 95 per cent. of the grains are fully mature, there being very few of the light or pithy grains present, *i. e.*, grains which are all hull and have no perisperm or only a pithy interior. Stems and pedicels are present, but not in excess of 2 per cent. The grains are large, hard, and have a very fine flavor. Hulls are present in very small quantity, their separation being due to the handling of the bags in which the pepper is imported. The hull is very difficult to remove from the inside layer. The diameter of grains is from 3 to 7 mm., and averages 5 mm.

The following results were obtained in an examination of four samples taken from different lots of this pepper. The analytical data herein recorded are all expressed in percentages:

No.	Ash.	Ether Extract.	Piperin.	Oleo-resin.
1	3·5	9·76	7·13	2·63
2	3·7	8·76	7·68	1·08
3	4·2	9·52	6·58	2·94
4	4·5	9.60	7·33	2·27

Average, ash, 3·975; ether extract, 9·41; piperin, 7·10; oleo-resin, 2·23; color of the ether extract, greenish.

Singapore and Tellicherry, which will be considered next, are the two finest peppers on the American market at the present time. *Tellicherry* pepper comes from Tellicherry in the Madras Presidency, British India. It is light to medium dark-brown in color, and small and pithy grains are almost entirely absent; stems and pedicels are present in very small amount. The grains are large and well filled. The sarcocarp is wrinkled in all grains, and adheres very closely. The amount of hull present is about 1 per cent. Grains which are unwrinkled do not appear in these two varieties. Four samples were examined, as follows:

No.	Ash.	Ether Extract.	Piperin.	Oleo-resin.
1	4·7	8·34	5·91	2·43
2	4·8	8·85	6·02	2·83
3	3·8	7·26	6·56	·70
4	4·5	7·62	6·82	·80

Average, ash, 4·45; ether extract, 8·01; piperin, 6·31; oleo-resin, 1·69; color of the ether extract was greenish.

Aleppy pepper, from India; color from light brown to almost black; small and pithy grains, about 2 per cent.; stems and pedicels present, 1–2 per cent.; unwrinkled grains, about 5 per cent.; hull, 2–3 per cent. The grains are smaller than the preceding, being from 2–6 mm. in diameter. The flavor is not so fine, and neither are the grains as solid. Two samples were examined:

No.	Ash.	Ether Extract.	Piperin.	Oleo resin.
1	4·7	9·65	7·70	1·95
2	4·7	9·47	6·75	2·72

The ether extract is of a greenish color.

Trang pepper, color light to dark brown; small and pithy grains numerous, 10–15 per cent.; stems and pedicels present, but in small amount. The grains vary greatly in size, being from 1·5–7 mm. in diameter. The sarcocarp is wrinkled in almost all the grains, unwrinkled grains appearing only here and there. Hull is present to

the extent of 2–3 per cent. The perisperm is small in most of the grains, therefore the hull is in greater proportion. Two samples were examined:

No.	Ash.	Ether Extract.	Piperin.	Oleo-resin.
1	3·9	8·44	5·12	3·32
2	3·8	8·83	5·61	3·22

The color of the ether extract is greenish-yellow.

Lienburg pepper comes from Japan. It is of a brown color, some of the grains being much lighter than others, and some almost black; about 20 per cent. are unwrinkled, and have a shiny appearance; from 15–20 per cent. have the hull knocked off, and are light brown in color; pithy grains are present in small amount. The grains vary in size considerably from the puffed up, unwrinkled ones to the pithy and wrinkled ones; stems and pedicels are almost entirely absent. Hull is present in quantity, being rubbed off from the unwrinkled berries, upon which the hull is very soft and brittle. This variety is used by some manufacturers for the decortication of pepper, but it does not give nearly so fine a flavor as Tellicherry or Trang. The diameter is 2–6 mm. Four samples were examined:

No.	Ash.	Ether Extract.	Piperin.	Oleo-resin.
1	3·8	8·70	6·50	2·20
2	4·0	9·48	6·28	3·20
3	3·6	8·83	5·98	2·85
4	4·0	8·78	6·31	2·47

Average, ash, 3·85; ether extract, 8·949; piperin, 6·2675; oleo-resin, 2·68. The color of the ether extract of Nos. 1 and 2 was brownish; of Nos. 3 and 4, reddish.

Lampong pepper comes from the Dutch Presidency, Sumatra. It is of a brownish or black color, having a dirty appearance from adhering soil. The grains are all about the same diameter—4–5 mm. Pithy and small grains are present to the extent of from 5–15 per cent.; stems and pedicels present in small quantity; earth and hull present in relatively large amount. Five to ten per cent. of the berries have the hull removed, and are of a dirty color. The hull adheres rather strongly. Four samples were examined:

No.	Ash.	Ether Extract.	Piperin.	Oleo-resin.
1	5·	8·92	7·76	1·16
2	5·5	10·31	8·30	2·01
3	5·4	8·76	7·00	1·76
4	5·2	9.58	7·28	2·30

Average, ash, 5·275; ether extract, 9·392; piperin, 7·585; oleo-resin, 1·8075; Ether extracts Nos. 1, 2 and 3 were of a dark green; No. 4, a yellowish-green.

West Coast Sumatra comes from the west coast of the Island of Sumatra. Color, dark brown to black; small pithy grains not so numerous, being about 5 per cent., but larger ones are present in considerable quantity; *i. e.*, the large pithy berries have the diameter of 4–5 5 mm. and consist of the dried sarcocarp surrounding a cavity containing nothing but some fine grains of a dark-brown color, occasionally a larger grain will be found which is of a whitish color internally, but which is not the perisperm. Stems and pedicels present about 1–2 per cent.; hull, 3–5 per cent. The sarcocarp is not wrinkled very much in about one-half of the grains; this fact gives the grains a larger appearance. The large amount of oleo-resin in these peppers is due to the large amount of hull in comparison with the inner portion; diameter, 2–6 mm. Two samples were examined.

No.	Ash.	Ether Extract.	Piperin.	Oleo-resin.
1	4·3	9·28	7·00	2·28
2	4·0	9·22	6·68	2·54

The color of the ether extract is greenish-brown.

Acheen pepper, variety A., comes from the Dutch province of that name. Dark brown in color; small pithy grains present to the extent of 3 per cent., but larger ones from 10–15 per cent.; stems and pedicels from 3–5 per cent.; unwrinkled grains about one-half of the whole amount. The hull does not have the appearance of being stretched over the inner portion, as in Singapore and Tellicherry, because the perisperm is very small and the hull is of about the same size as in the Singapore and Tellicherry peppers. Diameter of the grains, 2–6 mm. The varieties of this pepper are the poorest entering American ports. Four samples were examined.

No.	Ash.	Ether Extract.	Piperin.	Oleo-resin.
1	4·3	10·06	7·56	2·50
2	4·5	10·10	7·96	2·14
3	4·	9·80	7·67	2·13
4	4·7	9·20	7·10	2·10

Average, ash, 5·375; ether extract, 9·79; piperin, 7·57+; oleo-resin, 2·23+. Ether extract greenish.

Two samples of variety C. of the same pepper:

No.	Ash.	Ether Extract.	Piperin.	Oleo-resin.
1	5·5	10·46	10·02	·44
2	5·2	10·46	9·94	·52

Ether extract yellowish-green.

This variety contains almost no oleo-resin.

Coriander White Pepper.—It is of a whitish color; grains not wrinkled, with a black or brown speck at the base, which is slightly hollow; twelve to fourteen lines are observed running from base to apex. The outside whitish layer is always thicker at the apex than at the base; small and darker grains do not occur very frequently, although some appear with a light-colored coat slightly wrinkled. The reddish-brown testa under the whitish outside layer is very hard, thin and covers the seed-grain entirely. From the central cavity, which is about 1·6 mm. in diameter, a whitish mealy portion extends, being about one-fifth of the whole inside; from that to the testa is a hard translucent layer. The diameter of the whole grains varies from 3–7 mm. Four samples were examined.

No.	Ash.	Ether Extract.	Piperin.	Oleo-resin.
1	1·0	8·27	6·81	1·46
2	·8	11·68	9·00	2·68
3	1·	8·16	7·16	1·00
4	·8	7·90	6·84	1.06

Average, ash, ·9; ether extract, 9·; piperin, 7·45+; oleo-resin, 1·555. Color of ether extract, lemon-yellow.

Singapore White Pepper.—Color, grayish; larger grains not wrinkled, but from 10–15 per cent. of smaller wrinkled grains. There appears a black or brown speck at the base of all grains which are not wrinkled; base hollow. From ten to thirteen lines are observed running from base to apex. The outside grayish layer is thickest at the apex but not so noticeable as in the coriander pepper. The cavity in the center is larger than in the preceding variety, being 3 mm. in diameter in the larger grains. The mealy inside portion is from one-fourth to one-third of the whole layer. The layer between this and the testa is translucent and of a greenish color. Diameter 2 mm. Three samples were examined.

No.	Ash.	Ether Extract.	Piperin.	Oleo-resin.
1	1·1	8·78	7·26	1·52
2	1·0	8·45	6·78	1·67
3	1·2	8·20	7·10	1·10

Average ash, 1·1; ether extract, 8·57+; piperin, 7·04+; oleo-resin, 1·43. Color of ether extract, lemon-yellow.

Penang White Pepper.—Color, dirty yellowish; about 15 per cent. of the grains do not have the hull removed, but are covered with a yellowish clay, which in fact covers all of the grains; eleven

to thirteen lines are observed running from base to apex. The speck at the base is not easily seen; only after cleaning the grain can it in most cases be observed. The cavity is about 2 mm. in diameter, and is surrounded by a mealy portion, which is about one-fifth of the whole diameter; the remaining portion is of a greenish color and translucent. Diameter 2–5 mm. Three samples were examined.

No.	Ash.	Ether Extract.	Piperin.	Oleo-resin.
1	2·1	7·04	5·74	1·30
2	2·8	7·20	6·76	·44
3	2·6	6·80	5·83	·97

Average, ash, 2·38+; ether extract, 7·01+; piperin, 6·11; oleo-resin, ·93+. Color of ether extract, yellow.

Decorticated White Pepper.—The color is yellowish; the grains have a smooth, shiny surface and appearance, but no outside covering, consisting of the perisperm alone. Some of the grains have a little of the reddish-brown testa adhering, but not many. Broken pieces of perisperm are present in from 5–10 per cent.; that is, in that sold for whole white pepper. There is on the market what is known as broken decorticated white pepper. The central cavity is about 1·6 mm. in diameter, and is surrounded by a mealy portion, which constitutes about one-tenth of the whole grain; the other portion is of a yellowish color and does not appear clear as in the other white peppers. The grains are smaller than the other white peppers, being about 3–4 mm. in diameter, and do not vary much. No lines are observed in this pepper; a small hole is at the base, looking as if pricked with a needle. Three samples were examined.

No.	Ash.	Ether Extract.	Piperin.	Oleo-resin.
1	1·9	7·64	6·25	1·39
2	·8	6·60	6·30	·30
3	1·2	7·26	7·02	·24

Average, ash, 1·3; ether extract, 7·16+; piperin, 6·51+; oleo-resin, ·64+. Color of ether extract, yellow.

The hull is that portion of the grain known as the sarcocarp, which is removed in making white pepper and is sold as such. It varies in color from light brown to a dark brown. It has a pungent odor and taste, although sharper than when ground with the perisperm. The following is a statement of the analysis of several lots of hulls imported into this country.

No.	Ash.	Ether Extract.	Piperin.	Oleo-resin.
1	9·4	6·39	none	6·39
2	9·6	6·39	"	6·39
3	8·9	8·88	"	8·88
4	7·0	8·93	"	8·93
5	7·7	5·36	"	5·36
6	8·3	5·46	"	5·46
7	8·3	5·00	"	5·00
8	8·8	5·92	"	5·92

Average, ash, 8·5; ether extract, 6·54; oleo-resin, 6·54. Color of ether extract from light to dark brown.

As will be seen, there is no piperin in the hull, only oil and resin, but there are on the market hulls which contain broken pepper and will contain from 1 to 2 per cent. of piperin, but the ash is never less than 7 per cent., so that the more hull the greater will be the oleo-resin and the less will be the piperin found in a sample of pepper which has been adulterated with hull, also the ash will be greater.

Conclusions.—The ash should not be above 6.5 per cent. for black pepper, and 3 per cent. for white pepper. None of the samples examined gave so high a percentage of ash; 1 per cent. is allowed for sand and other material which has gotten in in the packing of the pepper; the highest ash was 5·5 per cent. for black pepper, and 2·8 per cent. for white pepper, which was a very dirty sample.

The ether extract should be between 7·5 and 10 per cent. for black pepper, and 6 and 9 per cent. for white pepper. In only one case did the ether extract exceed 9 per cent., and that was in coriander pepper, which sometimes runs as high as 11 per cent., but this variety is never ground for white pepper, but is sold in bulk whole, the cost being too great to permit being ground for commercial white pepper.

Piperin should be present in from 5·5 to 9 per cent. in a good black pepper. Any samples that do not show this percentage are not to be considered good peppers, and while they may be used to blend the flavor they should not be used in such quantity that the percentage of piperin would fall below 5·5 per cent.

The writer examined only one of the adulterants used in black and white peppers besides the hull, and that was cocoanut shells. The result was as follows: Ash 8 per cent., ether extract ·42 per cent.; if this is added to the pepper the ash will be high and the percentage of ether extract, piperin and oleo-resin will be low. Since

Black Pepper.	Ash.				Ether Extract.				Piperin.				Oleo-resin.			
	1	2	3	4	1	2	3	4	1	2	3	4	1		3	
Singapore	3·5	3·7	4·2	4·5	9·76	8·76	9·52	9·60	7·13	7·68	6·58	7·33	2·63	1·08	2·94	2·27
Tellicherry	4·7	4·8	3·8	4·5	8·34	8·85	7 26	7 62	5·91	6·02	6·56	6 82	2·43	2·83	·70	·80
Aleppy	4·7	4·7			9·65	9·47			7·70	6·75			1·95	2·72		
Trang	3·9	3·8			8 44	8·83			5·12	5·61			3·32	3·22		
Lienburg	3 8	4·0	3 6	4·0	8·70	9·48	8·83	8·78	6·50	6·28	5·98	6·31	2·20	3·20	2·85	2·47
Lampong	5·0	5·5	5·4	5·2	8·92	10 31	8 76	9 58	7·76	8·30	7·00	7·28	1·16	2·01	1 76	2·30
W. C. Sumatra	4·3	4·0			9·28	9·22			7·00	6·68			2·28	2·54		
Acheen A	4·3	4·5	4·	4·7	10 06	10·10	9·80	9·20	7·56	7·96	7·67	7·10	2·50	2·14	2·13	2·10
" C	5·5	5·2			10·46	10·46			10·02	9·94			·44	·52		
White Pepper.																
Coriander	1·0	·8	1·	·8	8·27	11 68	8·16	7·90	6·81	9·00	7·16	6·84	1·40	2·68	1·00	1·06
Singapore	1·1	1·	1·2		8·78	8·45	8·20		7·26	6·78	7·20		1·52	1·67	1·00	
Penang	2·1	2·8	2·6		7·04	7·20	6·80		5·74	6·76	5·83		1·30	·44	·97	
Decorticated	1·9	·8	1·2		7·64	6·60	7·26		6·25	6·30	7·02		1·39	·30	·24	

	Ash.								Ether Extracts.							
	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
Hull	9·4	9·6	8·9	7·0	7·7	8·3	8·3	8·8	6·39	6·39	8 88	8·93	5·36	5·46	5 00	5·92

the passage and enforcement of the new food laws there has not been much adulteration except in the use of hulls. This can be determined if the preceding method is adopted. If only about 10 per cent. have been added, recourse will have to be made to the microscope also.

IN AID OF THE STUDY OF THE HISTORY OF MATERIA MEDICA, MEDICINE AND CHEMISTRY.[1]

By Fr. Hoffmann.

Whoever has had occasion to enter upon researches in, and the study of, the history of drugs, aromatic spices, materia medica, or of medicine and chemistry, will have experienced perplexing difficulties in finding and selecting in the vast mass of the pertaining literature of all ages and peoples, the really valuable and most useful standard works for information and reference, or even to obtain a correct estimate of their nature and relative value and usefulness.

As in all literature, succeeding authors have more or less drawn upon the labors and writings of preceding generations and the intrinsic value of the accumulated bibliographic stock of consecutive centuries is to some extent a recurrent and apocryphal one. It therefore requires critical inquiry, intelligent discrimination and considerable time to obtain some familiarity with the precise value and authority, or the want of such, of the respective works, and it may not be amiss to offer some guiding advice to those who are about to spend time and patience in searching voluminous libraries and catalogues, by offering a brief list of some select works for reliable reference and for study.

List I comprises a selection of works replete with biliographic references and comments, as also with biographic information and notes; List II, a number of miscellaneous works relating to the subject of the respective sciences in general, and to the history of organic materia medica, medicine, pharmacy and chemistry in particular.

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[1] The above list of historical reference works was prepared by Dr. Hoffmann, of Berlin, Germany (Charlottenburg, Schlüter Str. 64), as a result of occasional inquiries and to save others the perplexities often experienced of finding in the mass of ancient, medieval and more recent literature, the most useful books for historical studies in the domains of medicine, pharmacy, materia medica and chemistry.—Editor.

These works afford a comprehensive survey of the pertaining literature from antiquity to modern times and offer valuable information conducive to the ready and proper choice of the literary resources best suited for historical research and study in the respective domains of knowledge.

LIST I.

IN CHRONOLOGIC ORDER.

Kurt Sprengel, "Versuch einer pragmatischen Geschichte der Arzneikunst." 4 vols. Halle 1792–1799. 4th edition. Leipzig, 1846.

T. F. Gmelin, "Geschichte der Chemie bis an's Ende des 18. Jahrhunderts." 3 vols. Göttingen, 1797–1799.

L. Choulant, "Handbuch der Bücherkunde für die ältere Medicin," zur Kenntniss der griechischen, lateinischen und arabischen Schriftsteller im aerztlichen Fache und zur bibliographischen Unterscheidung ihrer verschiedenen Ausgaben, Uebersetzungen und Erläuterungen. Leipzig, 1828. 2d edition under the title: "Geschichte der Literatur der älteren Medicin." Leipzig, 1841.

A. C. P. Callisen, "Medicinisches Schriftsteller Lexicon der jetzt lebenden Aerzte, Naturforscher, Apotheker, etc., aller gebildeten Völker." 33 vols. Kopenhagen and Altona, 1830–1845. (Replete with details concerning the literature of medicine, materia medica and natural sciences).

J. C. Poggendorff, "Bibliographisch-literarisches Handwörterbuch" zur Geschichte der exacten Wissenschaften, enthaltend Nachweisungen über die Lebensverhältnisse und Leistungen der Naturforscher aller Völker und Zeiten. 4 vols. Leipzig, 1858–1863.

H. C. Bolton, "A Select Bibliography of Chemistry," from the year 1492 to 1892. Washington, D. C., 1893. Supplement, 1899.

LIST II.

Lassen, "Indische Alterthumskunde." 5 vols. Bonn, 1847. 2d edition. Leipzig, 1858–1862.

E. F. R. Rosenmüller, "Handbuch der biblischen Alterthumskunde." 4 vols. Leipzig, 1830–1831. (Vol. 1, pp. 1–347, describes the minerals and plants of the Bible.)

Möhsen, "Geschichte der Wissenschaften." 4 vols. 1810.

Whewell, "History of the Inductive Sciences" from the earliest to the present time. 3d edition. 3 vols. London, 1857.

A. H. L. Heeren, "Ideen über die Politik, den Verkehr und den Handel der vornehmsten Völker der alten Welt." 2 vols. Göttingen, 1793–1796.

W. Heyd, "Geschichte des Levante Handels im Mittelalter." 2 vols. Stuttgart, 1879.

I. C. Wiegleb, "Geschichte des Wachsthums und der Erfindungen in der Chemie" in der ältesten und mittleren Zeit. 2 vols. Berlin, 1790–1791.

I. C. Wiegleb, "Geschichte des Wachsthums und der Erfindungen in der Chemie" in der neueren Zeit. Berlin, 1790–1791.

J. Beckmann, "Beiträge zur Geschichte der Erfindungen." 4 vols. Leipzig, 1780–1803.

J. Beckmann, "A History of Inventions, Discoveries and Origins," translated from the German by Wm. Johnston. 2 vols. London.

H. Haeser, "Lehrbuch der Geschichte der Medicin." 3 vols. Jena, 1852. 3d edition. 1875–1882. (Replete with historical and bibliographic notes.)

J. F. Royle, "Essay on the Antiquity of Hindoo Medicine." London, 1837.

J. F. Royle, "Das Alterthum der Indischen Medicin." Uebersetzt von Wallach und Hensinger. Cassel, 1839.

Wüstenfeld, "Geschichte der arabischen Aerzte und Naturforscher." Göttingen, 1840.

A. Philippe und Ludwig, "Geschichte der Apotheker" bei den wichtigsten Völkern der Erde. 2d edition. Jena, 1858. (Replete with information on the history of pharmacy, pharmaceutical education and bibliography.)

J. Berendes, "Die Pharmacie bei den alten Kulturvölkern." 2 vols. Halle, 1891.

Dioscorides, "De materia medica libri quinque." Kühn's Collectio. Vol. 25. Edited by Curtius Sprengel. Leipzig, 1829.

C. H. Pfaff, "System der Materia Medica." 7 vols. Leipzig, 1818–1824. (Replete with references to earlier writings. Vol. 1, pp. 28–41, contains a list of the pertinent literature of the eighteenth century.)

F. A. Flückiger and Dan. Hanbury, "Pharmacographia." London, 1879.

F. A. Flückiger, "Pharmakognosie des Pflanzenreiches." 3d edition. Berlin, 1891. (Both these works contain in an appendix a list of earlier works and bibliographical references.)

E. Gildemeister and Fr. Hoffmann, "Die Aetherischen Oele." Berlin, 1899. (Replete with historical and bibliographic notes and references).

Ferd. Hōfer, "Histoire de la Chimie," depuis les temps les plus reculés jusqu'à notre époque. 2 vols. Paris, 1869.

Hermann Kopp, "Geschichte der Chemie." 4 vols. Braunschweig, 1843–1847.

E. von Meyer, "Geschichte der Chemie." 2 edition. Leipzig, 1895.

Chr. G. Schmieder, "Geschichte der Alchemie." Halle, 1832.

Theophrastus, Eresius, "De Historia plantarum libri decem." Editio Wimmer. Lipsiæ, 1854.

Balfour, "The Plants of the Bible." London, 1885.

Woenig, "Die Pflanzen des alten Aegyptens." Leipzig, 1886.

Bretschneider, "On the Study and Value of Chinese Botanical Works." Foochow, 1870.

Hehn, "Kulturpflanzen und Hausthiere in ihrem Uebergange aus Asien nach Griechenland und Italien." 3d edition. Berlin, 1877.

Pritzel, "Thesaurus literaturæ botanicæ omnium gentium." Leipzig, 1872. (Contains on pp. 378–306 and p. 416 a list of the earlier American botanical literature.)

Kurt Sprengel, "Geschichte der Botanik." 2 vols. Leipzig, 1817.

Meyer, "Geschichte der Botanik." 4 vols. Königsberg, 1854–1857.

A BASIC REACTION OF AROMATIC AND FATTY ALDEHYDES.[1]

By Samuel S. Sadtler.

While carrying on some work on oils of orange and lemon, I found it very difficult to get accurate determinations of the citral in certain of these oils. They were so-called oleo-resins of orange and lemon, which contain a relatively large percentage of acid resins, and have not to my knowledge been, as yet, described. These oils are obtained by extraction with a volatile solvent, which seems to dissolve certain constituents from orange and lemon peel, which either

[1] Read at a stated meeting of the Franklin Institute, before the Chemical Section, and reprinted from advance sheets of the *Journal of the Franklin Institute.*

are not extracted at all, or else in smaller proportion by the processes of expression. It is recorded as a fact that the gravity of machine-expressed oil is greater than hand-pressed, and these oils are heavier than either.

With the use of sodium bisulphite for determining the aldehydes the addition compound forms partly in the aqueous layer and partly in the oily layer, and further work is very discouraging when this stage is reached. I soon tried sulphite of soda instead of the bisulphite. On heating a solution of this with the oil, the dihydrodisulphonate of sodium is formed, which is soluble in water, and two molecules of sodium hydrate are split off. Tiemann, in his work on the aldehydes of lemon-grass oil, pointed out that the reaction could be indicated by phenolphtalein, and by adding as olution of sulphurous acid from time to time, the end of the reaction could be known and the difference of volume of the oil could be told. This, however, is not a method that is capable of the greatest accuracy, and requires a special form of flask.

It occurred to me that the alkali formed in this reaction might be titrated for with standard acid, omitting the bicarbonate of sodium used by Tiemann. I first tried this with a standarized solution of sulphurous acid, but later found N/2 HCl, or normal HCl, very satisfactory and more convenient. It seems to require the use of more sulphite solution, however, as the sulphurous acid reforms sulphite from the NaOH split off. I will try, however, at a future time, to take up all the details necessary in the determination of citral as a matter by itself, and speak of the general procedure more especially at present.

From other tests on the oils in question, I found that they contained considerable quantities of acid resin, which would, unless previously neutralized, interfere with the results. In fact, I found the acid resin of the orange oil almost sufficient to neutralize all the alkali formed. This difficulty was overcome by neutralizing these acids first with dilute caustic potash solution (N/2KOH being convenient for the purpose, and if done quantitatively, might be interesting as part of a more or less complete examination of the oil) and rosolic acid solution as indicator, which will serve as indicator in the subsequent reaction.

Analyses were made with oil of orange, but until the mixtures of aldehydes of this oil are more fully studied, I will not refer to figures

obtained. If citral is not found to be the predominating aldehyde, the results would be of little value except as comparative.

For oil of lemon, 5 or 10 grammes are weighed into an Erlenmeyer flask, and after neutralization, 25 or 50 c.c. of a 20 per cent. sodium sulphite solution, depending upon the amount taken, is added. Before adding the sulphite solution, however, it is neutralized with a little N/2HCl, after being heated by immersion in a water bath. The sulphite solution used in these experiments required about ·75 c.c. of N/2HCl to neutralize at boiling temperature, with rosolic acid as an indicator. When the solutions were mixed a red color formed at once in the aqueous layer. This was discharged from time to time with N/2HCl. The flask is then heated and agitated frequently. The reaction is complete in about half an hour, if kept hot, and the layers mixed frequently. When the color is all discharged, or all but a very faint pink, which is not appreciably affected by a few drops more acid, the number of cubic centimetres of standard acid is noted. An emulsion forms, due to the neutralized resins, but that does not interfere with the reaction, if care is exercised.

The reaction, as written by Tiemann, is:

$$C_9H_{15}COH + 2H_2O + 2Na_2SO_3 = C_9H_{17}COH \atop (NaHSO_3)_2 + 2NaOH$$

and is probably correct, as the amount of citral and sulphite is shown below to be in the ratio of 1 to 2.

The amount of standard hydrochloric acid used expressed in terms of citral, in the above ratio of one molecule of citral to two molecules of HCl, divided by the weight of oil taken, gives the percentage of citral.

Analyses of citral in lemon oil, by this method, gave in two determinations:

	Per Cent.
I.	5·24
II.	5·29

I believe results within one or two tenths of a per cent. can be gotten in every case, with a little practice, by this method.

To check the accuracy of this reaction, I made some known mixtures of citral, which was kindly furnished by Dr. Harry F. Keller, and separated lemon oil terpenes, previously freed from citral.

	Calculated.	Found.
I.	8·68	8·85
II.	12·11	12·15

The method was further checked by using some pure, well-crystallized vanillin (M. P., 81° C.). The phenolic hydroxyl of the vanillin was first neutralized with a little caustic potash solution until it became a faint pink, using a little rosolic acid, sulphite solution added and titrated hot with N/2HCl, having first neutralized the sulphite solution at water-bath temperature as in the case of citral.

	Calculated.	Found.
Vanillin	100·00	99·00

This was a rough check on the method, but as the vanillin had not been specially purified further examination of the reaction with vanillin, vanilla extract, and samples of vanillin mixed with coumain and acetanilid will be undertaken.

The reaction is almost complete in the cold with vanillin and merely needs heat to complete the reaction more quickly. Standing a short time might have given the same results.

The reaction seems to be immediate and complete with fatty aldehydes. It will indicate the presence of one part of formaldehyde in 1,000,000 parts of water and when contained in food products the formaldehyde can be detected in a distillate of the same. The writer was able to detect formaldehyde in a solid product, partly made from milk, by first distilling with steam, neutralizing any free acid in the distillate with alkali, adding neutral sulphite solution and indicated upon which the presence of NaOH found in the reaction is clearly shown and can be accurately titrated for by means of standard acid.

Besides detecting and determining formaldehyde in milk a neutral sulphite solution used as s reagent is very useful.

The presence of acetone may be detected in wood spirits and determine acetic aldehyde in grain spirits. I noticed that a sample of grain alcohol, which, even after being carefully distilled over lime, gave a very brown color when made up into alcoholic potash, gave a very strong red coloration when mixed with sulphite solution and phenolphtalein.

Acetone and higher ketones were found to react, but further work on the various applications of this reaction must be taken up with the various substances in detail.

Referring again to essential oils, the reaction seems to be applicable to any essential oil, the single or predominating constituent of which is known, such as cinnamon, bitter almond oil, lemon-grass oil, cassia, etc.

CORRESPONDENCE.

ALTERNATIVE FORMULAS.[1]

Ever since the change made in the official formulas of substituting parts by weight, and which was subsequently followed by metric apportionment, trade and professional interest in the Pharmacopœia has been withdrawn and transferred to commentaries. In other words, pharmacists, instead of indicating a preference for the work of authority, absolutely ignore it, and in its place we find the various dispensatories, companions, etc. Not that I would say aught against these most useful, indispensable repositories of information, for they do more toward instructing the student—educating him as it is usually expressed—than the Pharmacopœia. Each work should occupy a distinct field. The Pharmacopœia, however, must be a book of working formulas, and these as plain, simple and direct as science in her modesty can make them.

I would like to suggest that the Committee of Revision, in anticipation of the same conditions prevailing in the future which have predominated in the past, do all in their power to prevent a continuance of this plight. It has operated during the past two decades and presumably will continue unless steps are taken to overcome it, and with this end in view I advisedly suggest that alternative formulas in definite common weights and measures be presented as is done by the British Pharmacopœia. Not that I would favor aping that work, but that we exercise good, wholesome judgment in discriminating what is useful from that which is practically useless. The sale of copies of the last revision were in a measure satisfactory, but this was due almost entirely to the fact that schools of pharmacy and medicine insisted upon students securing it as a textbook.

To continue the work with the metric system alone is to wilfully relegate it to a place among useless publications.

Very respectfully,

F. M. GOODMAN.

CHICAGO, ILL., January 7, 1904.

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[1] The above is an open letter to the Board of Trustees of the United States Pharmacopœial Convention.—EDITOR.

AMERICAN PHARMACEUTICAL ASSOCIATION.

To the Editor of THE AMERICAN JOURNAL OF PHARMACY, *Philadelphia.*

MY DEAR SIR:—I have been directed by the Council of the American Pharmaceutical Association to notify the pharmaceutical journals of an unavoidable delay in the issue of the 1903 Report of the Proceedings. Professor Diehl was prevented by prolonged indisposition from completing his report on the progress of Pharmacy within the usual time, but, having fully recovered, is now busily engaged in the necessary work, and the book will in all probability be ready for delivery early in April.

May I ask you kindly to give publicity to this notice in the columns of your valued journal?

Very truly yours,

CHAS. CASPARI, JR.,

BALTIMORE, January 21, 1904. *General Secretary.*

REVIEWS AND BIBLIOGRAPHICAL NOTICES.

MODERN MATERIA MEDICA AND THERAPEUTICS. By A. A. Stevens. Third edition, greatly enlarged, rewritten and reset; 8vo, pp. 663. W. B. Saunders & Co., 1903. Cloth, $3.50 net.

There seems to be no end to the publication of books containing pretty much the same facts, the only difference being that the facts are presented differently. One is almost inclined to congratulate the man who has had no time to write books, as has been said of Schwendener, the great German botanist, but who has confined himself to his researches and teachings. The Germans excel us because each author tries to write something new, he works and sweats until he has produced a work of originality, freshness and interest. Many American works on materia medica and therapeutics are so much alike that it seems a pity that the author has wasted his time, and that the physician is tempted to buy them. It is true in the case of text-books that the student is saved the taking of notes, or rather gets all of the notes, but the value of this may be open to question.

In the present book the drugs are classified according to their pharmacological action, and there are a number of chapters on applied therapeutics treating of (1) acute infectious diseases; (2) constitutional diseases; (3) diseases of the blood and ductless glands;

(4) diseases of the digestive tract; (5) diseases of the respiratory system; (6) diseases of the circulatory system; (7) diseases of the kidneys; and (8) diseases of the nervous system. There is also a chapter on remedial measures other than drugs, as electricity, massage, movement therapy for locomotor ataxia, the Schott or Nauheim treatment, cold, heat, hypodermoclysis and infusion, enteroclysis, lavage of the stomach, bloodletting, phototherapy and X-ray therapy and lumbar puncture.

The work is clearly written and contains a great amount of valuable information.

MATERIA MEDICA AMERICANA. By David Schöpf. Reproduced as No. 3 of the Bulletins of the Lloyd Library of Botany, Pharmacy and Materia Medica. J. U. and C. G. Lloyd, Cincinnati, Ohio. 1903.

This work of Schöpf is considered to be the rarest of American works bearing on the subject of American medicinal plants. It is interesting that the original, from which the present copy is produced, was found by Dr. Charles Rice in Italy and presented by him to the Lloyd Library.

An interesting biographical sketch of Schöpf, prepared by Dr. Ed. Kremers, accompanies this volume.

While some might question the wisdom of reproducing works of this kind, which are largely of historical interest, still, after all, it is to the earlier workers rather than their successors that the principal credit is due of recording and preserving the knowledge of medicinal plants and their uses. It has been much easier to rewrite the earlier work, which has been the starting point of the contemporaries and immediate successors of Schöpf, than to arrange the scattered facts into the first volume.

THE LATIN GRAMMAR OF PHARMACY AND MEDICINE. By D. H. Robinson, with an introduction by L. E. Sayre. Fourth edition, with elaborate vocabularies, thoroughly revised by Hannah Oliver. Philadelphia: P. Blakiston's Son & Co., 1012 Walnut Street. 1903.

The present edition retains the essential features of the earlier ones, but has been carefully revised. In accordance with the expressed wish of some pharmacists and physicians, the English method of the pronunciation of Latin has been explained. Professor Sayre has contributed chapters on prescription writing and chemical

terms, and has prepared a list of pharmaceutical and medical terms with their definitions.

The book is a good one and would make a valuable addition to every pharmacist's library, and should be in the hands of every clerk and student.

MISSOURI BOTANICAL GARDEN. Fourteenth Annual Report. St. Louis, Mo. Published by the Board of Trustees. 1903.

This volume contains besides the various reports of the officers of the Board and the Director, Dr. William Trelease, a valuable monograph on the genus Lonicera by Alfred Rehder, which is the first complete systematic treatment of this family since it was described by De Candolle. There is also a supplementary catalogue of the Sturtevant Prelinnean Library by C. E. Hutchings.

UNIVERSITÉ DE PARIS. ÉCOLE SUPÉRIEURE DE PHARMACIE. Theses for obtaining the degree of Doctor of Pharmacy of the University of Paris during 1902–1903.

The following theses have been published by graduates of the Superior School of Pharmacy of the University of Paris:

"De la Multiplicité des Produits fournis par un microbe pathogène," by Paul-Amable Antoine. The biochemical characteristics of the *Bacillus pyocyaneus* are given.

"Separation Quantitative de la Brucine et de la Strychnine," by Alexis Blancher. The author precipitates the alkaloids in acid solution by silico-tungstic acid, the salt formed is decomposed by ammonia and the displaced bases extracted by chloroform and weighed, nitric acid being afterwards employed in decomposing the brucine.

"Recherches Histologiques sur la Famille des Hypéricacées," by Georges Weill. A monogram on the inner morphology of the Hypericaceæ.

"Contribution à l'Etude chimique de l'Urine chez les Herbivores," by Eurgale Grotard. A chemical examination of the urine of various domestic animals.

"Etude des Hydrates de Carbone de Réserve de quelques graines de Palmiers," by Ernest-Henri Lienard. A chemical study of the reserve carbohydrates of some of the palm seeds.

"Etude sur l'Essence de Rue et sur la Methylnonylcetone," by

Denis-Honoré Carette. An investigation on the composition of oil of rue and methylnonylcetone.

"Recherches sur l'Appareil Sécréteur interne des Composées," by Marc-Alphonse Col. A study on the distribution of secretion reservoirs in the Compositæ and their importance in systematic work.

"De l'Extrait de Fougère Male," by Ed. Schmidt. A chemical, physiological, and pharmacological study of aspidium.

"Recherches sur la Famille des Oxalidacées," by Fr. Chauvel. A consideration of comparative morphology of this family together with the history from a botanical as well as economic point of view.

"Contribution a l'Etude de la Constitution du Tannin de la Noix de Galle," by Alexandre Vournasos. A monograph on the constitution of the tannin of nutgalls.

"Etude sur les Préparations Officinales des Loganiacées," by B. Hébert. A study of official preparations of nux vomica and Ignatia seed.

"L'Iodure d'Hexyle," by A.-Ch.-P. Lecorneur. A study of iodide of hexyl obtained from mannite.

"L'Acide Paraoxyphénylsalicylique et ses Sels," by Jean Faure. A thesis on paraoxyphenylsalicylic acid and its salts.

"Quelques cétones obtenues au moyen de l'acide caproïque normal," by G.-E. Poissonnier. A study on some of the ketones obtained from normal caproic acid.

"Sur quelques cétones dérivées du Métacymene," by François B. Reyes. A monograph on the ketones derived from metacymene.

"Méthode générale de préparation des Ethers Oxydes Phénoliques symétriques et dissymétriques," by E.-R. Lerat. On the symmetric and asymmetric oxide ethers of phenol.

Sinonimia vulgar y Cientifica de las Plantas Mexicanas. Arreglada por el Dr. José Ramirez, con la colaboracion del Gabriel V. Alcocer. Mexico: Oficina Typográfica de la Secretaría de Fomento. Calle de San Andres, num. 15. (Avenida Oriente 51.) 1902.

This is a very valuable book, containing nearly 10,000 synonyms and common names of Mexican plants. The author gives the correct botanical origin, family name and distribution of every plant. A valuable bibliography accompanies the work. There is a large amount of Mexican, Central and South American material in various

collections in the United States, the specimens only having common names; and this classification by Ramirez of Mexican plants, together with that of Peckolt on Brazilian plants, will be helpful in their identification. The work is of special interest to botanists and others interested in the plant products of Mexico.

OBITUARIES.

DR. HENRY CARRINGTON BOLTON.—A well-known chemist and occasional contributor to pharmaceutical journals, died in Washington, D. C., on November 19, 1903, in the sixty-first year of his age.

Dr. Bolton was born in New York, January 28, 1843. He graduated from Columbia College in 1862, and obtained his degree of Ph.D. from Göttingen some time after.

Dr. Bolton was a member of a number of scientific societies, a prolific writer, and a scientific investigator of acknowledged merit. At the time of his death he was connected with the Smithsonian Institution.

JOHN DWIGHT, one of the pioneer manufacturers of sodium bicarbonate, was born in South Hadley, Mass. He died in New York on November 25, 1903, in his eighty-fourth year.

Mr. Dwight began the manufacture of sodium bicarbonate about 1846, with his brother-in-law, Dr. Austin Church, and succeeded in building up a very large and lucrative business.

DR. CYRUS EDSON.—At one time president of the old New York City Board of Pharmacy, and prominently identified with the manufacture of several well-known proprietary medicines, died in New York on December 2, 1903.

Dr. Edson was born in Albany, N. Y., he graduated from the College of Physicians and Surgeons, New York, in 1881. He was prominently identified with and occupied several important public positions.

THOMAS P. LANGDON.—At one time a member of the firm of Gilpin, Langdon & Co., Inc., died at his home in Baltimore, November 23, 1903.

EDWARD LEON MILHAU.—One of the oldest and best known pharmacists of New York, died in New Brighton, Staten Island, at the home of his daughter, Mrs. Royden Vosburgh, May 26, 1903.

Mr. Milhau was born in New York City in 1834, and was a graduate and subsequently a member of the College of Pharmacy of the City of New York, which institution he served in several important official capacities. He was also a member of the American Pharmaceutical Association, joining in 1858.

EDWARD H. OGDEN, who was at one time actively engaged in the drug business in Philadelphia, died in Riverton, N. J., on December 9, 1903, in the seventy-second year of his age.

Mr. Ogden, an apprentice of Jenks & Ogden, was a graduate of the Philadelphia College of Pharmacy, Class of '53. He was in business for a number of years on Market Street below Seventh with T. Morris Perot, the firm name being T. Morris Perot & Co. At the time of his death Mr. Ogden was the President of the Francis Perot's Sons Malting Company.

CHARLES S. OGDEN, a brother of Edward H. Ogden, was at one time engaged in the wholesale drug business with the now venerable Vice-President of the Philadelphia College of Pharmacy, Wm. J. Jenks. Mr. Ogden was born in Philadelphia, November 21, 1822, and died January 12, 1904.

He was interested in a number of beneficial and relief associations, and despite his age, 82, still took considerable interest in local and municipal affairs.

ROBERT C. C. WALKER, a member of the firm of Powers & Weightman, died in Philadelphia on December 19, 1903, in his sixty-sixth year.

Mr. Walker was a graduate of the law department of Harvard University, and followed his profession for some years as a member of the Philadelphia Bar. He also occupied several important political positions.

Mr. Walker was admitted as a partner in the house of Powers & Weightman in 1893, and continued to take an active interest in its affairs to the time of his death.

HENRY MARTIN WHITNEY died at North Andover, Mass., on December 2, 1903, in his seventy-fifth year.

Mr. Whitney was an active member of the American Pharmaceutical Association, the Massachusetts State Pharmaceutical Association, the Boston Druggists Association. He was, for a number of years, president of the State Board of Pharmacy, and was also an ex-president of the American Pharmaceutical Association.

M. I. W.

PHARMACEUTICAL MEETING.

The fourth of the Pharmaceutical Meetings of the Philadelphia College of Pharmacy, of the present series, was held on Tuesday afternoon, January 19th, at 3 o'clock. Mr. E. M. Boring, a member of the Board of Trustees, presided.

The first speaker was the well-known manufacturer of thermometers, Mr. Gustavus Pile, of this city, who read a paper on the subject of "Thermometers," which was illustrated with models of the earliest forms used, as well as those of more recent manufacture, some of which he presented to the College. In addition to the paper, Mr. Pile also remarked concerning the earlier systems of weights and measures in which the divisions appeared to be in eighths and fourths in contrast to the decimal system later adopted. In regard to the boiling point of water he said that the deviations in the barometer made a difference of as much as two to three degrees. Mr. Pile also spoke of the difficulty of blowing bulbs of the correct size, particularly in attempting to make a new bulb for an old scale, and said that a glass-blower might work several days before he made a bulb of the proper size. In using thermometers it is important to heat the whole length of the tube, as in their construction they are surrounded by steam. He pointed out that the value of mercury over alcohol in the construction of thermometers was (1) that it will record a much higher temperature; (2) that it possesses a uniform rate of expansion for each increment of heat; (3) it is more easily freed from air; and (4) has a greater conducting power. The alcohol used in spirit thermometers is 95 per cent., wood alcohol answering the purpose as well as grain alcohol.

Mr. Pile referred to the ignorance of many people with regard to the use of thermometers, and related an incident of a physician in whose hands a clinical thermometer always registered 101°, due to the fact that the mercury was held in the tube and the physician was not sufficiently informed to shake it down before using the thermometer. He showed an order which he had received which read as follows: "Kindly express us at once one Foreign height thermometer for factory use."

Mr. Boring said that the presence of Mr. Pile took him back to the time when his father, Dr. W. H. Pile, came to these meetings and presented papers of both chemical and pharmaceutical interest

as well as those relating to his own specialty, that of making instruments of precision for chemical, pharmaceutical and medical work.

The subject of clinical thermometers was brought up by Mr. Boring, who said that many persons had an impression that a two-minute thermometer was not reliable, because they do not give it time to respond. In reply to Dr. Lowe, Mr. Pile said that the one-minute thermometers were of thinner glass, and therefore conducted the heat more rapidly. Mr. Pile said that owing to the variation in thermometers, particularly those used for clinical purposes, the Government at Washington had asked all manufacturers to send their standards for comparison, as there is considerable difference in the expansion of different kinds of glass as well as a difference of expansion of mercury and glass. In this connection, Mr. Wilbert stated that the Bureau of Standards at Washington offer to standardize clinical thermometers for pharmacists at the rate of six for twenty-five cents each, and that the work is quite accurate.

On motion of Mr. Wiegand, a special vote of thanks was tendered Mr. Pile for his paper and the apparatus which he presented.

A paper on "Some Rare Fixed Oils," by Dr. George R. Pancoast and Willard Graham (see page 70), was presented by Mr. Graham. In the discussion of this paper Mr. Boring asked if oils of the various nuts were articles of commerce, to which Mr. Graham replied that they were but were not easily obtainable. Mr. Boring also spoke of an early experience of his in making fluid extract of ergot. He said that he followed the U.S.P. directions and packed the drug very thoroughly in the percolator and obtained at first a colorless liquid which was the oil of ergot. He also stated that they used to powder the ergot in cold weather. Dr. Lowe called attention to the fact that the German Pharmacopœia directs the oil of ergot to be extracted from the drug before using it. Mr. Wiegand called attention to some experiments that were made by the late Mr. Charles Bullock on the oil of nux vomica and said that the oil gave the alkaloidal reactions.

Mr. Wilbert read a paper on "Lime Water" (see page 66) and exhibited some specimens of commercial oyster-shell lime. Mr. Boring said that if he was not mistaken Professor Procter recommended the filtering of lime water. Mr. Wiegand said that his custom had been to remove the lime water by means of a syphon,

as he considered the air, on account of the carbon dioxide, to be prejudicial.

Mr. Boring said that his method was to make 5 gallons of lime water at a time, keeping it in half-gallon bottles, which are tightly stoppered, and the solution being filtered as wanted. Mr. William McIntyre said that he followed the usual method of using the lime over again and marking the lots as they were decanted, and he thought that the second lot was better than the first. Mr. C. H. LaWall said that most pharmacists considered that as long as there was any precipitate in the stock bottle that it could be employed for making lime water. Mr. Boring called attention to the fact that some pharmacists make up large quantities of lime water, dispensing it from containers which are not air-tight, and which they give away free of charge. This custom is to be deprecated not only on account of the worthlessness of the product, but because good lime water requires care in its preparation and the pharmacist should be recompensed for his skill.

James W. Gladhill presented a paper on the "Examination of Commercial Peppers," which was illustrated with a large number of specimens (see page 71). Dr. Lowe referred to the fact that hardtack was used at one time as an adulterant of pepper. Professor Kraemer stated that at the present time some of the cheaper grades of ground pepper which he had examined contained the endocarp or stone of the olive, cayenne pepper and pepper hulls, and showed by means of drawings how these adulterants might be quite easily detected by the use of the microscope.

Mr. Gladhill commented on the Government standards for pepper; and also said that the decorticated black pepper was largely used for making commercial ground white pepper.

Some remarks, on the making of paste for the pharmacist's use, were made by Professor Lowe, who said that he found a paste consisting of equal parts of the following: Powdered acacia, tragacanth and dextrin, to be quite satisfactory, *i. e.*, yielded a paste which, though adhesive, permitted the labels to be easily removed. He also recommended the flour paste, the formula for which is given in Remington's Practice of Pharmacy. He stated that in his store they had some trouble recently in making this paste from some of the commercial flours, as it would not properly thicken, and found

that Millbourne flour was the most satisfactory. He also referred to the importance of pasting labels on bottles and packages.

At the next meeting, February 16th, the following provisional programme will be presented:

"Technical Analysis of Water," by W. E. Ridenour.

"Some Refined Methods in Water Purification," by Wm. G. Toplis.

"The Chemical and Bacteriological Analysis of Water, with Interpretation of the Results," by Dr. Albert Robin, Wilmington, Del.

"Progress in Pharmacy—a Quarterly Review," by M. I. Wilbert, Ph.M.

HENRY KRAEMER,
Secretary.

THE PHILADELPHIA COLLEGE OF PHARMACY.

The quarterly meeting of the members was held December 28th, at 4 P.M., in the library. The President, Howard B. French, presided.

Thirteen members were present.

The minutes of the semi-annual meeting held September 28th were read and approved.

The minutes of the Board of Trustees for the meetings held September 1st, October 6th and November 5th, were read by the registrar, and approved.

Mr. Beringer, for the Historical Committee, reported verbally that the work was going on; the enquiries were being mailed and replies were being received. The card index was completed; the amount appropriated was nearly exhausted, principally for postage.

Mr. Rumsey, for the Committee on Membership, presented a list of names for election to honorary membership in the College in recognition of their distinguished services in the professions of medicines, pharmacy and allied sciences. The report was received and approved.

The President announced the death of Dr. William H. Webb, who was a graduate of the Class of 1868 and a member of the College since 1868. Dr. Webb had practised medicine for many years in Philadelphia. His death occurred on December 20th.

Mr. Krewson announced the death of Gustav A. Appenzeller, Class of 1877, and Edward H. Ogden, Class of 1853. These gentlemen were not members of the College but were well known in the city, and it was fitting that a record of their deaths should be made.

The thanks of the College were tendered to H. K. Mulford & Co. for their donation of vaccine virus and shields used in the recent vaccination of the students.

C. A. WEIDEMANN, M.D.,
Secretary.

PERSONAL NOTES.

C. LEWIS DIEHL, Professor of Pharmacy in the Louisville College of Pharmacy, has retired from the retail drug business and will in the future devote himself to his literary and professional work. Professor Diehl has had an interesting career. He was apprenticed to the late Dr. John R. Angney, Fifth and Spruce Streets, Philadelphia, in April, 1858, and graduated from the Philadelphia College of Pharmacy in March, 1862. Then, until the early fall of 1862, he had charge of the laboratory of John Wyeth & Brothers, who at that time had large army contracts, and he may thus claim to have been their first chemist in the manufacturing line—leaving them only because he considered it his duty to serve in the Army. Having returned early in 1863, discharged on account of wounds, he secured a position as chemist under Maisch in the U. S. A. Laboratory at Sixth and Oxford Streets, in Philadelphia, remaining until January, 1865, when it became evident that the work in the laboratory would languish, or cease. Taking his way to Chicago, which he at that period claimed as his home, he secured a position with the firm of Bender, Mahla & Co., manufacturing chemists, but left them in July, having received an invitation to reorganize and manage the Louisville Chemical Works, an enterprise which had been called into life by the late Dr. J. Lawrence Smith and organized by the late Dr. Edward R. Squibb. He remained in charge of this concern until January, 1869, when, owing to a business disagreement of the owners, the Chemical Works passed into other hands, and he severed his connections with them.

In the early summer of 1869 he purchased a store at the southwest corner of First and Walnut Streets, Louisville, where he continued until June, 1874, when he sold out, preparatory to opening the store at Third and Broadway, which he has recently (November 28th) disposed of with the intention of relinquishing active participation in the practice of pharmacy.

Professor Diehl joined the American Pharmaceutical Association in 1863 and attended its meetings for the first time at Detroit in 1866. He was elected chairman of the Committee on the Progress of Pharmacy, and re-elected at New York in 1867. He made a volunteer report on the Progress of Pharmacy at Richmond in 1873, in consequence of the inability of the chairman, elected at Cleveland, to serve; was elected to the newly created office of Reporter on the Progress of Pharmacy, and re-elected annually until 1891, when he declined re-election; but was again elected in 1895, and annually since then. In 1874 he had the honor of being elected President of the Association, holding that office in addition to that of Reporter.

In 1871 Professor Diehl assisted in organizing and establishing the Louisville College of Pharmacy, served as its President during the first decade, and also as one of its teachers for many years—resigning as Professor of Pharmacy about the middle of the eighties, but again entering upon its duties in 1894. He was a member of the Kentucky Board of Pharmacy for quite a number of terms—serving on the first board appointed under the law, and is now a member, serving a second consecutive term of five years, after having been out of the board for quite a period. He has also been a member of the Kentucky Pharmaceutical Association from its birth, and honored by being elected its President several years ago.

Professor Diehl has also been connected with the Revision of the United States Pharmacopœia for many years. He was elected a delegate to the Convention of 1870, from the Chicago College of Pharmacy, of which institution he was then a member, and subsequently delegated by the Louisville College of Pharmacy to the Pharmacopœial Conventions of 1880, 1890 and 1900, serving now his third term as a member of the Committee of Revision of the U.S.P.

FRANK G. RYAN, formerly Instructor in Pharmacy in the Philadelphia College of Pharmacy, and for the past four years chief pharmacist for Parke, Davis & Co., having supervision over the manufacture of all their chemical, pharmaceutical and biological products, was recently elected to the Board of Directors of that firm, which position was made vacant by the death of Mr. Warren, late general manager.

THE SOCIETY OF PHARMACY OF PARIS.—The following corresponding members were elected at the annual meeting of the society: Professor Bruylants, University of Louvain; C. Burhen, Clarens (Switzerland); Codina y Langlin, Barcelona; Professor Dambergis, Institute of Pharmacy of Athens; Prof. Donald MacAlister, University of Cambridge; Mr. Dulière, Brussels; Professor Greenish, London School of Parmacy; Professor Greshoff, Harlem; Mr. Poulsson, Christiana; Mr. Roemers, Aarhus (Denmark), and Mr. Waller, Vexio (Sweden).

GUSTAV PFINGSTEN, editor of *Deutsche-Amerikanische Apotheker-Zeitung*, died at his home in New York City on January 7th. He was born in Ranzel, near Cologne, May 25, 1843, and studied in Germany, coming to this country in 1869. He received the degree of M.D. from the New York University Medical College in 1889. He entered the drug business soon after coming to this country, and continued the same until the time of his death. He was very active in the work of the German Apothecaries Society, with which organization he became early allied, being president for two terms, and was editor of the organ of the society since 1896.

PHILADELPHIA ASSOCIATION OF RETAIL DRUGGISTS.—At the annual meeting of the association, held January 8th, the following officers were elected for the ensuing year: President, Thomas H. Potts; Vice-Presidents: William L. Cliffe, William E. Lee and David J. Reese; Recording Secretary, Nathan A. Cozens; Financial Secretary, Carl W. Shull; Treasurer, George W. Fehr. Executive Committee: A. T. Pollard, W. H. Gano, Charles Leedom, Richard H. Lackey, H. C. Blair, A. J. Frankeberger and H. A. Nolte.